

CLAIMS

What is claimed is:

1. A method of storing dataflow analysis properties associated with a computer procedure, in a linked list of data storage nodes, the method comprising generating a data storage node for a new property to be associated with the computer procedure by

allocating a data storage node, the data storage node including a data storage space for storing an identifier of a property and at least a first pointer storage space for storing a pointer identifying a location of an other data storage node,

storing into the data storage space of the allocated data storage node, an identifier of the new property for which the node was allocated, and

storing into the first pointer storage space of the data storage node, a pointer identifying a location of an other data storage node, the other data storage node storing an existing property associated with the computer procedure that is subsequent to the new property in a predetermined property order.

2. The method of claim 1 adapted to preparing a linked list including data storage nodes of either a first smaller size or a second larger size, wherein data storage nodes of the second larger size include a second pointer storage space for storing a pointer identifying a location of an other data storage node, wherein the allocating step further comprises

selecting a size for the data storage node.

3. The method of claim 2 wherein the size for the data storage node is randomly selected.

4. The method of claim 1 wherein the pointer stored into the first pointer storage space identifies a location of a data storage node storing an existing property associated with the computer procedure that is next subsequent to the new property in the predetermined property order.

5. The method of claim 2 wherein the pointer stored into the first pointer storage space identifies a location of a subsequent data storage node of the first smaller size that is storing an existing property associated with the computer procedure that is next subsequent to the new property in the predetermined property order.

6. The method of claim 5 wherein the pointer stored into the second pointer storage space identifies a location of a subsequent data storage node of the second larger size that is storing an existing property associated with the computer procedure that, as compared to all existing properties associated with the computer procedure that are stored in data storage nodes of the second larger size, is next subsequent to the new property in the predetermined property order.

7. The method of claim 1 further comprising deleting a data storage node for a property to be disassociated with the computer procedure.

8. A linked list of data storage nodes storing dataflow analysis properties associated with a computer procedure, comprising

a plurality of data storage nodes, each data storage node including a data storage space for storing

an identifier of a property and at least a first pointer storage space for storing a pointer identifying a location of an other data storage node,

the data storage space of each node storing an identifier of a first property for which the node was allocated, and

the first pointer storage space of each data storage node storing a pointer identifying a location of an other data storage node, the other data storage node storing a second property associated with the computer procedure that is subsequent to the first property in a predetermined property order.

9. The linked list of claim 8 comprising data storage nodes of either a first smaller size or a second larger size, wherein data storage nodes of the second larger size include a second pointer storage space for storing a pointer identifying a location of an other data storage node.

10. The linked list of claim 9 wherein the sizes of individual nodes in said linked list are randomly determined.

11. The linked list of claim 9 wherein the pointer stored into the second pointer storage space of a node of the second larger size, identifies a location of a subsequent data storage node of the second larger size.

12. A method of calculating approximations of sets of entry and exit properties for each basic block of a computer procedure prior to performance of an iterative dataflow analysis, each basic block being associated with a set of entry and exit properties, as well as

543

property modifications caused by the basic block, wherein each iteration of the iterative dataflow analysis process does not increase the membership of said sets, the method comprising selecting and processing each basic block in a predetermined order by copying into the set of entry properties of a currently selected basic block, the exit set of properties from a previously selected and processed basic block,

modifying the set of entry properties of the currently selected basic block in accordance with the property modifications caused by the currently selected basic block, to generate the exit properties for the currently selected basic block.

13. The method of claim 12, wherein said predetermined order is a depth-first order.

14. The method of claim 12, wherein said entry and exit properties comprise expressions available upon entry and exit from each basic block.

15. The method of claim 14, wherein said modifications caused by a basic block comprise expressions generated by the basic block.

16. The method of claim 15, wherein said modifications caused by a basic block further comprise expressions killed by the basic block.

17. The method of claim 14, wherein said modifications caused by a basic block comprise expressions killed by the basic block.

18. The method of claim 12, wherein the entry properties of the currently selected basic block are copied from the exit properties of a control flow predecessor of the currently selected basic block.

slB
19. The method of claim 12, wherein processing the current basic block further comprises removing from the entry properties of the currently selected basic block, any properties not found in the exit properties of all previously selected and processed basic blocks which are control flow predecessors of the currently selected basic block.

20. A computer system for compiling a computer procedure into a machine-readable representation, the computer system comprising:

(a) an optimizer that optimizes the computer procedure into an optimized representation, the optimizer storing dataflow analysis properties associated with the computer procedure, in a linked list of data storage nodes, a data storage node for a new property to be associated with the computer procedure being generated by allocating a data storage node, the data storage node including a data storage space for storing an identifier of a property and at least a first pointer storage space for storing a pointer identifying a location of an other data storage node, storing into the data storage space of the allocated data storage node, an identifier of the new property for which the node was allocated, and storing into the first pointer storage space of the data storage node, a pointer identifying a location of an other data storage node, the other data storage node storing

an existing property associated with the computer procedure that is subsequent to the new property in a predetermined property order; and

(b) a machine-readable code generator that generates a machine-readable representation of the computer procedure from the optimized representation.

21. A program product, comprising:

(a) a program configured to store dataflow analysis properties associated with a computer procedure, in a linked list of data storage nodes, and generate a data storage node for a new property to be associated with the computer procedure by

allocating a data storage node, the data storage node including a data storage space for storing an identifier of a property and at least a first pointer storage space for storing a pointer identifying a location of an other data storage node,

storing into the data storage space of the allocated data storage node, an identifier of the new property for which the node was allocated, and

storing into the first pointer storage space of the data storage node, a pointer identifying a location of an other data storage node, the other data storage node storing an existing property associated with the computer procedure that is subsequent to the new property in a predetermined property order; and

(b) a signal bearing media bearing the program.

22. The program product of claim 21, wherein the signal bearing media is a transmission type media.

23. The program product of claim 21, wherein the signal bearing media is a recordable media.

Add 17

IBM R0997-127
WH&E IBM/09
Patent Application